USER PROGRAMMABLE TERMINALS

M-1976
UPT

INPUT

User Programmable Terminals
(8/76)

AUTHOR

TITLE

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USER PROGRAMMABLE TERMINALS

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I. INTRODUCTION

METHOD OF RESEARCH

- This study of the market for User Programmable terminals was performed by INPUT during the period from February 1976 to April 1976.

- Questionnaires were developed for telephone interviews with users and vendors of terminal devices.

- User interviews consisted of 173 telephone contacts within the pre-selected ten industry areas. The completed interview results were as follows:

  - User programmable terminal users 57
  - User non-programmable terminal users 3
  - Limited function terminal users 5

Exhibit I-1 presents a list of the companies included in the interview data base. One company (United Airlines) was independently interviewed twice at two of their various locations. Appendix B gives a detailed

EXHIBIT I-1

LIST OF USER INTERVIEWS

Number	Respondent	Industry
01	Security Pacific Bank	Finance
02	Glendale Adventist Medical Center	Medical
03	City of Hope Hospital	Medical
04	Marshfield Clinic	Medical
05	Interstate Business Services	Insurance
06	Insco Systems Corporation	Insurance
07	C.E. Tyler Company	Manufacturing
08	Clevite Engine Parts Division	Manufacturing
09	General Electric, Nuclear Energy Div	Manufacturing
10	Diamond Shamrock	Manufacturing
11	Standard Oil of Ohio	Manufacturing
12	May Department Store	General Retail
13	First National Bank of Pennsylvania	Finance
14	Bancology, Inc.	Finance
15	Maricopa County College District	Education
16	University of California at Berkeley - Anthropology	Education
17	University of California at Berkeley - Engineering	Education
18	Kuhn's Big K Stores Corporation	General Retail
19	Providence Washington Insurance	Insurance
20	Prudential Insurance	Insurance
21	Northwestern Mutual Insurance	Insurance
22	Excello	Manufacturing
23	Microelectronics	Manufacturing
24	Fairmont Foods	Manufacturing
25	Del Monte Corporation	Manufacturing
26	Pillsbury Company	Manufacturing
27	Farm Machinery Corporation	Manufacturing

EXHIBIT I-1 (Continued)

LIST OF USER INTERVIEWS

Number	Respondent	Industry
28	Atlantic Richfield	Manufacturing
29	Commonwealth Edison	Utility
30	Southern Railway	Transportation
31	Missouri Pacific Railroad	Transportation
32	Transportation Management Services	Transportation
33	United Airlines, Chicago, Illinois	Transportation
34	AEL Albuquerque	Federal Government
35	U.S. Naval Weapons Center	Federal Government
36	Federal Highway Administration	Federal Government
37	Western Savings	Finance
38	American Automated Services	Finance
39	United Airlines, Englewood, Colorado	Transportation
40	Florida State University	Education
41	Capital Life Insurance	Insurance
42	Industrial Nucleonics	Manufacturing
43	Combustion Engineering	Manufacturing
44	Los Angeles Community College	Education
45	Northern Arizona University	Education
46	Mellon Bank	Finance
47	Shared Medical Systems	Medical
48	American Library Association	Education
49	Indiana University	Education
50	Riverside City College	Education
51	Methodist Hospital	Medical
52	Lakeview Hospital	Medical
53	Triton College	Education
54	Aklona/Brand-Rex	Manufacturing
55	Allegheny Power Service	Utility
56	Northern Illinois Gas	Utility
57	Cincinnati Bell Telephone	Utility
58	Philadelphia Electric	Utility
59	Norwich Pharmacal	Manufacturing
60	Black & Decker	Manufacturing

EXHIBIT I-1 (Continued)

LIST OF USER INTERVIEWS

Number	Respondent	Industry
61	R. Dahnking	General Retail
62	Denver Public Schools	Education
63	Arizona Government	Federal/State
64	Utah Systems Planning & Computing	Federal/State
65	City of Minneapolis	Federal/State

NOTE: Over 100 additional companies were contacted and not interviewed in-depth because they did not use terminals with intelligent capabilities.

account of the response received from each of the companies interviewed.

- Several econometric forecasting services predict a recession in the mid-1978 through mid-1979 period. This has been included in this analysis.

- Sources for EDP expenditures besides INPUT's own research included:
  - Datamation salary and expenditure surveys
  - EDP/IR EDP expenditure analysis forecasts
  - Department of Commerce forecasts of salary and positions for computer professionals
  - INFOSYSTEMS salary and EDP expenditure analysis
  - WEMA salary surveys
  - IBFI forecasts of business forms usage trends

- Sources for terminal forecasts besides INPUT's own research included:
  - Industry and product analyses in recent issues of Datamation, INFOSYSTEMS, Data Communications User, Modern Data, EDP/IR, Auto Transactions, Electronic News, Predicast, Electronics, Data Pro, and Computer Decisions.
  - Supplier inputs through interviews with:

Braegan	Teletype
Burroughs	Wiltek
Datapoint	Wintex Computer
Incoterm	Zentec
Raytheon	Intertech
Sycor	McDonnell Douglas Automation

- Discussions with knowlegable computer professionals in NRMA, American Bank Association, U.S. Savings and Loan League, Federal Home Loan Bank Board (SF), American Hospital Association, ADAPSO and AIRINC.

• Forecasts of terminals by type and expenditure by industry were developed from these sources.

TERMINAL PRODUCT TYPES

• There are three product types of terminals used throughout the study and these are:

- User Programmable (UP)
- User Non-Programmable (NP)
- Limited Function (LF)

Definitions of these product types is based on hardware definition of product capabilities.

USER PROGRAMMABLE

Single Station Terminal

• The single station terminal or stand-alone programmable terminal includes general purpose user programmable alpha/numeric devices. These terminals are operator-oriented and include a data entry keyboard or general purpose typewriter and generally support one or more low cost peripheral such as a printer or disk unit. Examples of single station terminals are:

- Datapoint 5500
- Incoterm SPD 10/20 and SPD 10/25
- Sycor 340 , 350

Multistation-Shared Processor

- This category includes all general purpose alpha/numeric CRT's connected to a programmable terminal or other computer processing device. These systems generally include more than one CRT and/or keyboard operated devices and may support several peripheral units. Examples of such systems are:
  - Burroughs TC 3600
  - Four Phase IV-70
  - Raytheon PTS 100
  - Sanders 810
  - Sycor 440

Teleprinter

- Teleprinters are terminal devices with hardcopy capability. These units also often support one or more low cost peripheral units. Included in this category are: Burroughs TC600 and NCR bank systems.

Remote Batch

- This category includes only those programmable terminals which are used to transmit data between a host processor and remote site. The category includes terminals which perform RJE functions in a HASP environment, and/or transmit large volumes of card, disk, tape or printer data.

USER NON-PROGRAMMABLE

Single Station Terminal

- Single station terminals are general purpose user non-programmable alpha/numeric CRT's. These terminals generally include a general purpose teletype or typewriter style keyboard. These units may support one or more low cost peripherals such as a printer or tape cassette.

Terminals in this category are:

- ADDS MRD 740
- CDC 713
- Data 100 73
- Hazeltine 1000 and 2000
- IBM 2265, 3276, 3740 and 3742

Multistation-Shared Processor

- This classification includes all general purpose user non-programmable alpha/numeric CRT multistation terminals. These units are operator-oriented systems and include a data entry style or typewriter keyboard. These CRT's are attached to a master controller which supports two or more CRT's and associated peripherals. Examples of terminals which are in this category include: IBM 2260, 3271 and 3272; and Sanders 720.

Teleprinter

- Teleprinters are user non-programmable devices with keyboard and with hardware capability. These character printer terminals are operated and generally support one or more slow speed peripherals. Examples of user non-programmable teleprinters are:

- Anderson Jacobsen 841
- Data Products Portocom
- Memorex 1240
- Singer Model 30
- Teletype 28, 33 and 35
- Texas Instruments 700 series
- Univac DCT 500/100

Remote Batch

- This category includes only those terminals which are used to transmit data between a host processor and a remote site. The category includes terminals which perform RJE functions in a HASP environment, and/or transmit large volumes of card, disk, tape or printer data. Examples include:

  - Control Data 200 UT
  - Data 100 70
  - IBM 2780
  - Univac DCT 2000

LIMITED FUNCTION

- Limited function defines those terminals which were originally developed for and are primarily sold to satisfy the needs of a specific type of user. The average terminal price includes controller and peripheral units inherent to the system. Examples of several systems and the vendors specializing in them are:

  - Bank Teller Transaction:

    Burroughs TC 700 and TC 750
    FDS TATTS
    IBM 3600 FCS
    NCR 270/275

  - Credit/EFTS:

    Addressograph Multigraph AMCAT-1
    IBM 2730
    NCR 285/724
    TRW 4000

- Factory Data Collection:

  CDC Transactor

  DPI Solar

  IBM 1030

  Singer 100 Series

- Point-of-Sale (POS)

  IBM 3650, 3660

  NCR 280

  Singer MDTS

  Unitate/Regitel Model 2 and 302

  On-line Electronic Cash Registers

II. INPUT RECOMMENDATIONS

GENERAL

- Terminal vendors should target on general purpose User Programmable terminals immediately, and sell them as standard, non specialized terminals.

- These terminals should be packaged and marketed first:
  - Across industries in certain key applications
  - In industries for specialized applications.

This will give optimum growth.

- Interview results show that users are replacing existing terminals with programmable terminals; terminal vendors should key on selected replacement markets where they have entree now.

- Vendors should be aware of a forecast recession in 1978 and 1979 and terminal market saturation in many industries in early 1980's.

STRATEGIES

- Vendors have three choices only, since INPUT considers the 'window' on viable OEM relations is now shut:
  - Purchase existing manufacturer
  - Make from scratch, including electronics
  - Buy microprocessors

INPUT recommends the third option unless obtaining an established company is possible at a very attractive rate.

- INPUT strongly recommends alignment with one or more industry service companies; these companies will provide:

- Service Network (referred to later)
- Software for industry/application use.

Particular examples of such companies are Tymshare, OSI, RCC, CSC, National Data, and Bradford.

- Timing - Now is almost too late - independents and manufacturers are staking-out positions.

NATURE OF PRODUCT

- Competition is bringing out higher priced terminals and has been shipping fewer of them than in the past. INPUT feels they are passing by the very market they went after. Vendors with new terminal devices should come in with low priced products and target sales for large contracts. Price range target should be $6,000 to $10,000 for general purpose User Programmable and $5,000 to $7,000 or less for Limited Function terminals.

- Terminal should consist of single tabletop unit with:
  - Typewriter Keyboard
  - Microprocessor (Not Mini)
  - Plasma Display
  - Peripheral Controller for up to 8 (Optionally 16) Units

- Microprocessor memory should be 4K ROM and 1 to 2K RAM (Bytes) - enough for many installations - upward expandable.

- It should also offer complete range of peripherals with software support as options including:
  - Simple non-impact printer
  - Diskette

- The unit should be modular priced even allowing user to maintain and/or install itself.

SOFTWARE AND SUPPORT

- Vendors · should provide a diagnostic maintenance center on 24 hour call. This should be network based so that a terminal at a user's location can be connected directly to a diagnostic computer.

- Vendors - should provide, in addition, diagnostic routines to be run at user site.

- Training centers (eventually at least three for East, West, and Central regions) should be provided.

- Additionally, vendors should develop:
  - Audio Visual (A/V) training routines.
  - Operator assisted training routines resident on diskettes for terminal.

- The services company aligiments could provide applciation software. Vendors , in addition, must then provide and maintain systems software -- This could be subcontracted.

- The terminal should emulate major manufacturers' in-place terminals:
  - HASP Stations (EBCDIC)
  - ASCII Terminals
  - Multiple Speeds

MARKETING

- Target multiple single station sales. Leave multistations to minis and mainframe manufacturers.

- Program the user. Most users and purchasers will be non-EDP people. Emphasize:
  - Ease of Operation
  - Simple Maintenance
  - Adjustment to their needs, e.g.:
    - Color Matching
    - Coffee Holders (away from keyboard)
    - Compactness
    - Design

- Emphasis in sales should be replacement of people and paper costs.

- Reasons for sale, in order of importance to the user are:
  - Applications
  - Cost
  - Maintenance/Support

RECOMMENDED INDUSTRY/APPLICATION AREAS

- Major area of emphasis should be manufacturing. Particular applications for general purpose User Programmable terminals are:
  - Accounting
  - Order Entry (Sales Offices)
  - Order Processing and Distribution.

For Limited Function terminals look at Factory Data Collection, and in particular, process control using sensor based analog/digital conversion and machine tool control.

- Another industry to strongly consider is Finance. Emphasis on:
  - Accounting
  - Trust
  - Customer Services

In Limited Function, look at Consumer Finance Market (new limited function - only CDC in it at present). Also, whole EFTS area for ATMS, CBCTs/POS terminals. Problem area because of horrendous competition - IBM, AT&T, Burroughs, NCR, Docutel and others.

- Federal Government - concentrate on health and welfare markets.

Particular application areas for GP and LF terminals are:

  - Medicaid/Medicare/CHAMPUS/NHI
  - PSROs and HMOs.(These are strictly in the private sector but receive most funds from government agencies hence 'top down' marketing)

- Transportation - only growth areas are in motor freight. Particular applications are accounting, billing, government reporting and freight billing control systems (FBCS).

- Insurance growth areas are primarily associated with life and health applications. Large and medium size companies offer high sales potential.

- Medical field has a strong requirement for User Programmable terminals to handle patient accounts and in-hospital communications and record keeping. A potential new market is with professional medical centers for processing forms like Medicaid/Medicare, patient record and insurance.

CROSS INDUSTRY APPLICATIONS

- INPUT strongly urges vendors to consider development of applications that will be applicable to more than one industry. Applications particularly geared toward User-Programmable terminals are:
  - Training/Education
  - Accounting
  - Payroll/Checkwriting
  - Order Processing

FUTURE REQUIREMENTS

- Information Processing is projected to replace word processing from 1980 and on. When terminal and word processing markets saturate in the early 1980's, Information Processing systems will require inexpensive User Programmable terminals for the office, the factory, and even the home. INPUT recommends this future market be studied and preparation for entry to it be made early.

INP

III. MARKET STRUCTURE

TERMINALS LEAD EDP GROWTH

- Total user expenditures on EDP equipment, services and software will increase from $29.1 billion in 1975 to $49.4 billion by the end of 1980 at an annual average growth rate of 11.2% per year. By comparison, expenditures on User Programmable terminals will increase from $371 million in 1975 to $1,597 million in 1980 representing an average annual growth rate of 34%; about treble the growth rate of the overall industry.

- The highest average annual growth rates for EDP equipment will take place in the following industries:

  - Manufacturing 20%
  - Medical 19%
  - Transportation (Motor Freight) 19%

TERMINALS IMPACT EDP EXPENDITURES

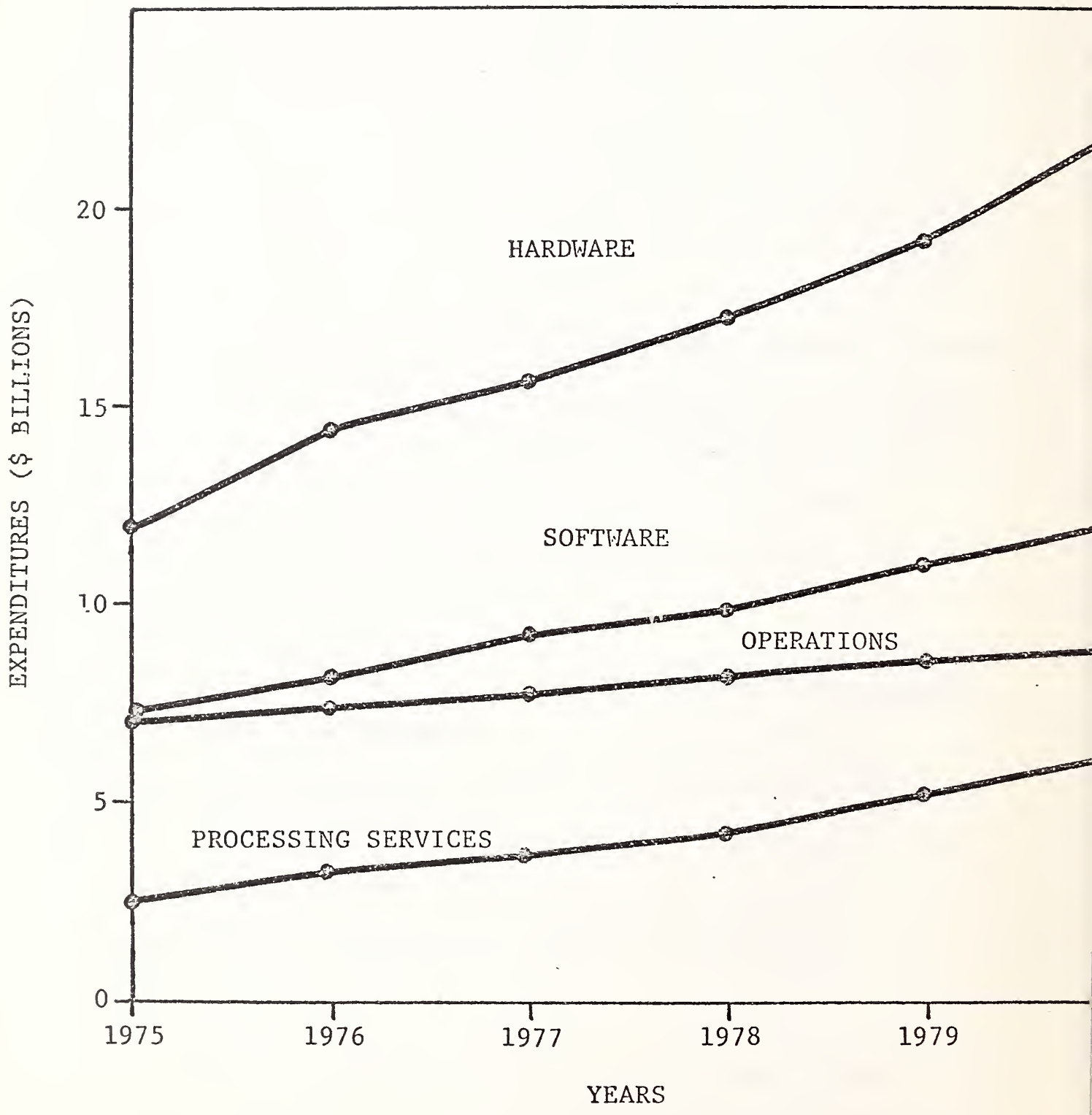
- The distribution of EDP expenditures by type: Hardware, Software, Operations, and Other Services is given in Exhibit III-1. The major factors contributing to the increase in expenditures are:

  - The growth in demand for remote computing capability
  - Automation of information processing for small businesses.

- The key growth years for software are 1976 through 1978. User Programmable terminals and Limited Function terminals will provide

EXHIBIT III-1

TOTAL EDP EXPENDITURES



much of the heavy demand for software which will rise as high as 14% in 1978. Saturation and anticipated poor economic conditions in 1978 and 1979 will cause software expenditures to taper off by 1980.

- The reduction of EDP data preparation and entry expenses will reduce expenditures by DP departments on operations personnel. Operation expenditures are the responsibility of the functional using departments in the majority of User Programmable and Limited Function installations. We see this trend being set by accounting departments throughout the industry sectors studied, by retail POS users and the banking community.

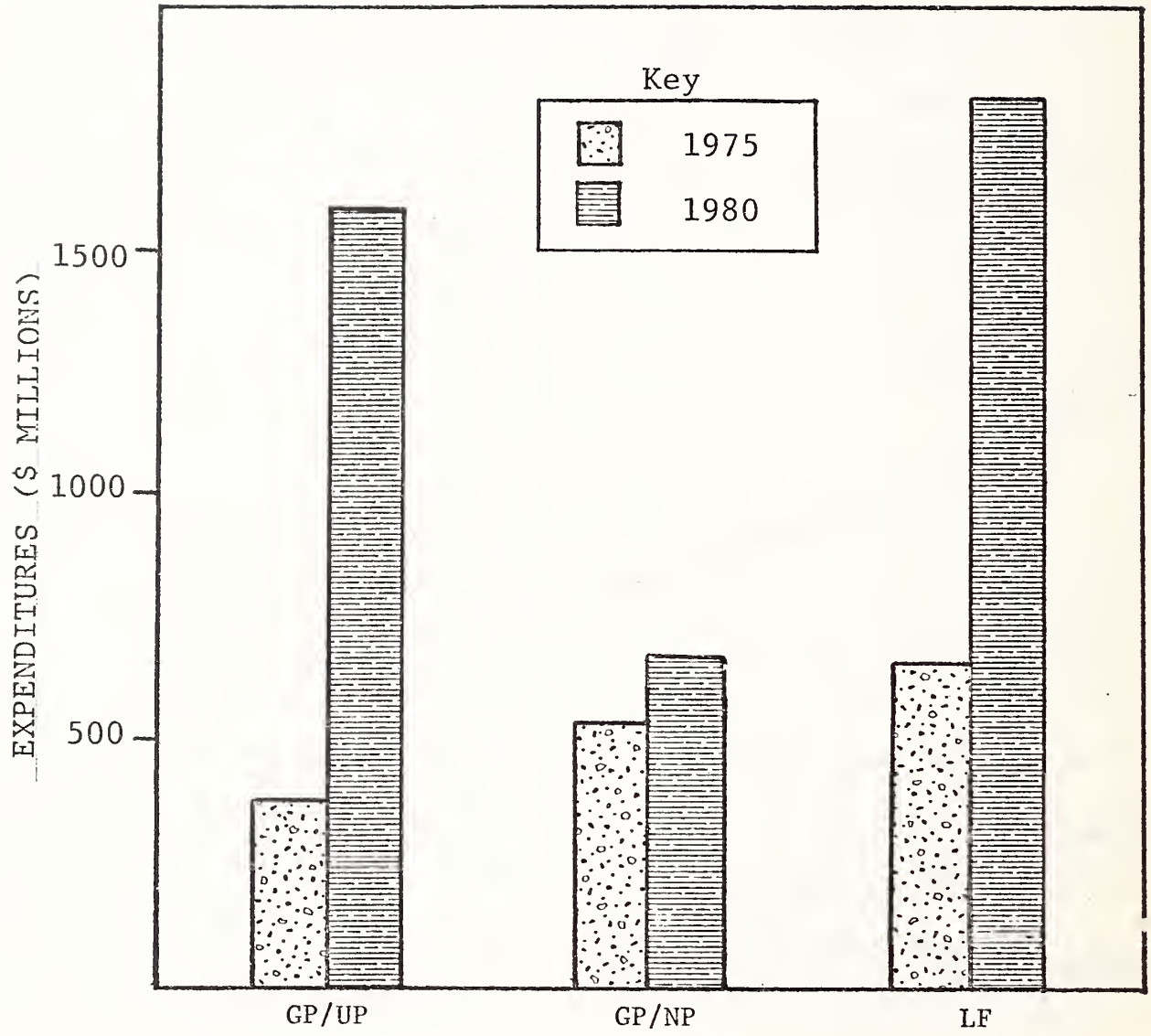
- As shown in Exhibit III- 2 User Programmable and Limited Function terminals will have substantial overall growth in end user expenditures between 1975 and 1980.

- End user expenditures are projections based on equivalent annual rental (EAR) and maintenance costs for installed terminals. The EAR estimates include: rentals, based on rentals of 30 days; lease arrangements from one to two years; and outright and 'time' purchases. Rental expenditures are projected to drop substantially by 1980 while purchased equipment will remain stable and the amount of leased equipment is projected to rise.

- Purchased unit expenditures in the User Programmable market will remain stable because of:
  - Lower cost terminals due to volume sales, improved technology and decreased maintenance costs.
  - Distribution of purchase authority to the functional user.

EXHIBIT III-2

END USER TERMINAL EXPENDITURES
($ Millions)



GP/UP - General Purpose/User Programmable
GP/NP - General Purpose/User Non-Programmable
LF - Limited Function

- Leased unit expenditures will increase because of:
  - Distribution of remote equipment to lower levels of management.
  - Greater participation of central processor manufacturers in the User Programmable terminal market with existing lease arrangements.

- The average annual growth rate in EAR for User Programmable terminals between 1976 and 1980 is 34%. Interviews completed for this study indicate user demand for "intelligence" in their terminals is based on both software and hardware criteria.

SOFTWARE ADVANTAGES OF USER PROGRAMMABLE TERMINALS

- Application packages suited to the users' immediate needs and the expectation by users that more extensive applications will be made available to them over the next few years are major reasons cited for purchasing User Programmable terminals. Users see the "value" of their equipment increasing as they are able to expand and add to their applications. This is the same logic which caused retailers to purchase POS terminals and use them as "electronic cash registers" while waiting for the development of POS systems.

- The ability to emulate multiple host computers in a network environment is advantageous to the user which is changing or considering changing mainframe supplier, for example, replacing UNIVAC with IBM hardware or vice versa. One major user in banking described his preference for User Programmable terminals as a release from being "locked in" by software systems.

- User Programmable terminals offer equal performance to User Non-Programmable terminals often at lower functional cost to the end user.

- The ability to "program" the end user through flexible software capability is an enhancement for applications requiring multiple and complex forms usage. Industries with high employee turnover rates find "programming" the end user cuts down their training and personnel expense.

HARDWARE ADVANTAGES OF USER PROGRAMMABLE TERMINALS

- Efficiency and speed of being able to get the job done at the functional users' location are main advantages of these terminals.

- The User Programmable terminal can be operational when the central computer is experiencing difficulties. A reduction of workload on the central computer by utilizing the terminal as a front-end processor is also an important consideration by end users.

- These terminals reduce traffic over data lines from remote locations to the central computer.

- Data Processing Managers were particularly interested in the benefits of not needing to expand the central computer as rapidly through the use of User Programmable terminals.

- In this context, INPUT projects that by 1985, 40% of all processing will be done at remote sites. This will primarily be new processing as opposed to existing applications processing.

- Peripheral equipment of various types can be driven by User Programmable terminals, allowing unique applications to be implemented.

- User Non-Programmable terminals face stiff competition from terminals offering additional capabilities like front end processing and competitive pricing for functional tasking. Average annual growth rate reflects the bottom falling out of this market by 1978.

- Limited Function terminals expenditures, high in the service oriented industries, show an annual average growth rate above the overall EDP industry. Growth through 1980 is projected at 22% and is attributable to the demand for POS, credit and EFTS systems. Saturation of these markets is projected by 1985 based on the current heavy demand in the market.

- Other Limited Function terminal markets will open-up, primarily due to the use of low cost micro-computers and micro-controllers as well as reduction in communications cost. Particular market opportunities will lie in monitoring and control devices such as security and traffic applications.

SHIPMENT GROWTH

- There is a dramatic rise in the shipments of User Programmable and Limited Function terminals from 1976 to 1980. This is illustrated in Exhibit III-3. The market for multistation CRT and remote batch terminals will begin to saturate by 1979-1980 for both User Programmable and User Non-Programmable terminals, as shown in Exhibit III-4.

EXHIBIT III-3

TERMINAL SHIPMENTS BY TYPE

($ Millions)

Terminal Type	1975	1976	1977	1978	1979	1980	AAGR
General Purpose/Non-Programmable							
SS/CRT	202	258	227	188	179	171	- 3.3
MS/CRT	91	55	38	18	0	0	N/A
Teleprinter	114	123	103	84	64	43	-17.7
Remote Batch	22	9	7	5	2	0	N/A
SUB-TOTAL	429	445	375	295	245	214	-13.0
General Purpose/User Programmable							
SS/CRT	183	327	388	450	498	546	24.4
MS/CRT	175	430	532	634	719	805	35.7
Teleprinter	147	252	278	304	334	363	19.7
Remote Batch	135	188	190	192	150	108	- 4.3
SUB-TOTAL	640	1197	1388	1580	1701	1822	23.3
Limited Function	675	901	1045	1192	1224	1256	10.9

AAGR = Average Annual Growth Rate

EXHIBIT III-4

TERMINAL SHIPMENTS BY TYPE

(Thousands of Units)

Terminal Type	1975	1976	1977	1978	1979	1980	AAGR
General Purpose/Non-Programmable							
SS/CRT	62	81	72	64	62	60	-0.7
MS/CRT	23	15	10	5	0	0	N/A
Teleprinter	41	46	39	32	25	17	-16.2
Remote Batch	.72	.35	.27	.19	.08	0	N/A
General Purpose/User Programmable							
SS/CRT	21	31	39	46	52	58	22.5
MS/CRT	29	78	104	130	148	166	41.7
Teleprinter	13	24	32	39	51	63	37.1
Remote Batch	1.8	3.1	3.4	3.6	3.0	2.3	5.0
Limited Function	120	170	195	219	223	226	13.5

AAGR = Average Annual Growth Rate

- Several econometric forecasting services predict a recession period in 1978 and 1979 which will heavily affect the EDP market. Shipment figures reflect a slow growth over this period.

- During the recession of 1974-1975, EDP shipments flattened but did not drop considerably as they are projected to do in 1978-1979. There was some growth in small systems market, new demand for POS, EFTS and other on-line systems during the last recession. There will not be comparable growth in these areas in 1978-1979.

- 1976 through 1978 are the key growth years for terminals. Terminals, in the market for approximately seven years, have proven their value to end users and the demand for additional terminals and new location (i.e., first time) terminals is high.

- Point-of-Sale (POS), Electronic Fund Transfer Systems (EFTS), credit systems and similar markets will begin to saturate in terms of new locations in the 1978-1980 period.

- Although the Non-Programmable market is shrinking, per se, it still could represent a growth opportunity for established vendors capable of competing on a strictly price-reliability basis. These vendors will target on increasing their market share.

OEM MARKET CLOSING

- The OEM window for terminal manufacturers may already have closed. There is not one single major system supplier (general purpose, minicomputer or application oriented) who does not already have a supplier. Key competition includes:

  - CDC: with other storage & I/O peripherals
  - DEC: with storage and printer peripherals
  - HP: with storage peripherals and minicomputers
  - Memorex: with storage peripherals

Exhibit III-5 lists OEM competition, potential and markets. A review of these companies is in order for determination of potential marketing agreements.

- OEM Competition - Companies listed are actively seeking new markets and are not linked irretrievably to another company for User Programmable terminals or any terminal component devices which would limit them approaching new markets. These companies can be either suppliers or users.
- OEM Potential - Companies listed where OEM potential exists. They have established markets and contractual agreements. They include small systems houses and maintenance services (computer services) companies.
- OEM Markets - Companies listed have supplier agreements to be provided terminals or components which will mean they are out of the market for two years. They are not competition or potential in an OEM sense.

SERVICE COMPANIES

- Major opportunity exists with the independent computer service companies, specifically:
  - ADP
  - Bradford
  - CSC
  - Informatics/Equimatics
  - Optimum Systems, Inc.
  - Rapidata
  - Remote Computing Corp.
  - Tymshare, Inc.

- It is anticipated that McAuto, Boeing Computer Services, Martin Marietta Data Systems and Greyhound Data Systems will join SBC/CDC in eventually supplying their own terminal products. Broadbased competition for "blanket" terminal orders from these firms is already underway from Western Union Data Systems, RCA Services Corp. and Leasco.

INPU

EXHIBIT III-5

OEM COMPETITION

Beehive

Bunker Ramo

CDC

Courier

Datapoint

Applied Digital Data

DEC

GTE/IS

HP

Lear Siegler

TEC

Delta Data

Genesis I

Raytheon

Infoton

Trivex

Tektronics

Teletype

CCI

Data Disc

POTENTIAL

AJ

Incoterm

Sycor

Centronics

Infoton

Data Products

Intel

National Semiconductor

Pertec

Small Systems Houses

Computer Services firms

OEM MARKETS

Digital Control

General Automation

GE/IS

Gerber Scientific

Gould

Interdata

NCR

Burroughs

Data 100

Four Phase

HIS

Univac

Westinghouse

Cummins Allison

OEM MARKETS (Continued)

Entrex

Harris

MDS

CMC

Inforex

Addressograph

Bourns (BMS)

TI

Litton ABS

Basic 4

Varian Data

Bendix Comp. Graphics

Cincinnati Milacron

Computer Automation

Data Pathing

Lockheed Electronics

M&M (Singer Sub)

Martin & Wolf

Microdata

Mod Comp

Prime

Nixdorf

Qantel

RCA Service Corp.

Wells Teleprocessing

Comten

WUDS

EXHIBIT III-5 Continued

OEM MARKETS (Continued)

Leasco

Redactron (Burroughs Sub)

Rolm

Sanders

Trendata

Ultimacc

Wang Labs

Wiltek

• Independent terminal suppliers who have outside marketing agreements in addition to marketing their products on a direct basis are:

- Applied Digital Data Systems, Inc. (ADDS) supplies NCR with CRT products.
- Datapoint supplies its model 1100 to Honeywell for marketing under the MTS 7500 system.
- Incoterm supplies McAuto with terminals for marketing to the hospital community.
- Pertec supplies Univac with its key-to-disk units for marketing in Univac's multistation/shared processor systems.
- Sycor supplies its terminals to Olivetti for marketing in European countries and to Mitsui and Company, Ltd. of Tokyo for marketing and service in Japan.

INDUSTRY SECTORS

• Exhibits III-6 through III-9 show total terminal market growth within the ten industries studied by product type (UP, NP or LF).

USER PROGRAMMABLE MARKETS - LARGE BASE - HIGH GROWTH

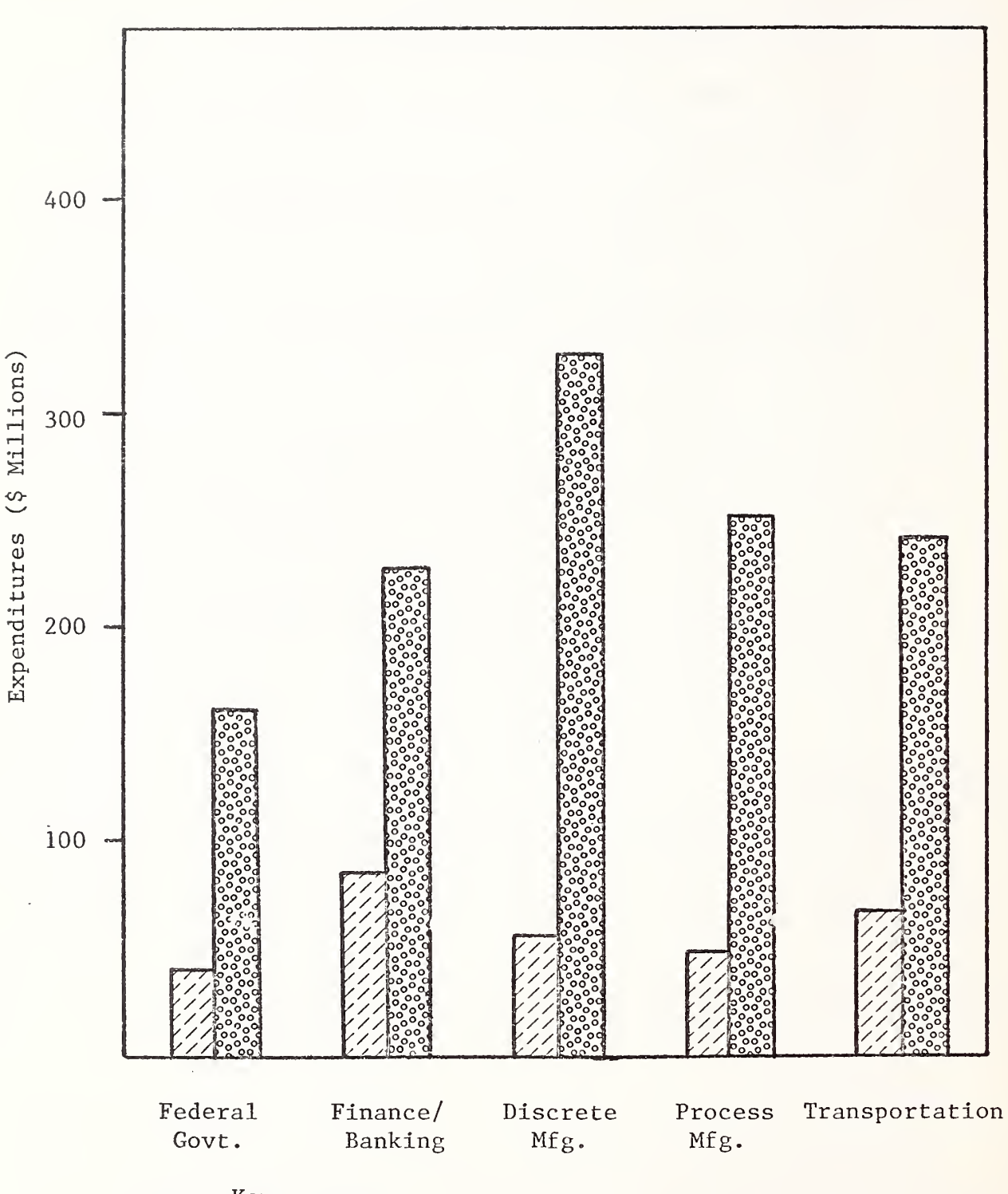
Manufacturing

• Manufacturing is the highest growth industry for terminals. Expenditures will increase to $1.1 billion in 1980 of which more than 50% will be for user programmable terminals. Accounting, order entry, order processing, and production control and scheduling are the applications primarily in demand throughout the industry. INPUT recommends these software application areas be throughly developed to meet the needs of the large and medium size manufacturing company. With pre-

EXHIBIT III-6

GENERAL PURPOSE/USER PROGRAMMABLE
TERMINAL EXPENDITURES

(End Users - $ Millions)



packaged, simple applications, sales efforts can be aimed directly to the using department (e.g., sales, accounting, branch-office sales, etc.)

- Discrete manufacturing is the largest of the ten sectors studied. Projected revenues are $808 billion by 1980. It is also the largest industry sector in terms of overall EDP expenditures and in User Programmable terminal expenditures ($327 million 1980).

- Primary industries to be considered for User Programmable terminals are listed below with applications pertinent to each industry subsector other than those cross-industry applications mentioned above.

  - Transportation Equipment:
    - manufacturing information and control systems
    - scientific
  - Electrical Machinery
    - bills of material
    - inventory control
    - automatic design layout
    - template design masters
  - Non-Electrical Machinery
    - automatic design layout
    - manufacturing information and control systems
    - quality control
    - inventory control
  - Fabricated Metal Products
    - numerical control
    - on-the-shop-floor record keeping
  - Aerospace Companies
    - numerical control

- Printing and Publishing
  - text editing
- Apparel
  - pattern design
  - bills of material
  - job estimates

• Process manufacturing is the second largest industry sector in terms of projected User Programmable terminal expenditures. Primary industries to be considered for User Programmable terminals are listed below with applications pertinent to each industry other than those cross-industry applications listed at the beginning of this section.

- Chemical Products
  - finished goods inventory control
  - materials packaging
  - paint blending and color matching
- Petroleum Processing
  - production scheduling
  - inventory control
  - simulation studies
- Food Processing
  - on-line inventory control
  - food distribution
  - route accounting

Finance

• Banking is the second highest growth industry for both User Programmable and Limited Function terminals. Commercial banks and thrift institutions are pursuing new business services and are in competition

with each other over expansion of these services. EFTS services, charge card services and POS user support are major areas opening for User Programmable terminals.

- Limited Function terminals for EFTS credit checking, CBTS and teller systems will increase in market value more than double in the next five years. A new area open to suppliers of Limited Function terminals is in the consumer finance markets, only CDC has penetrated this market to date.

- Burroughs and NCR currently have strong market interests with the small and medium institutions while IBM dominates the rest of the banking market.

Transportation

- The motor freight industry will be the major contributor to the rise in User Programmable terminals in the transportation industry. Expenditures for User Programmable terminals will increase from $67 million in 1975 to $242 million in 1980, a growth rate of 29% per year.

- The leading large freight firms are developing operations oriented data systems. These systems are known as freight billing and control systems (FBCS) and have extensive on-line communications and computer processing requirements. The major subsystems include:
  - Freight Billing and Control (FBCS) processing and switching
  - Shipment scheduling and training
  - Central rating of freight bills
  - Administrative message switching
  - Equipment location
  - Equipment maintenance and control

- User Programmable terminals with local edit and processing capability will be able to meet the requirements of these field agents and brokers.

Federal Government

- The federal government is the single largest user of EDP in the United States. It has conducted a study of remote computing and is now moving toward implementation at a number of levels within the government.

- Prime motivating factor is increased productivity and improved agency performance. Large users will continue to be DOD, AEC, and NASA.

- Areas where User Programmable and Limited Function terminals will find major markets are listed below along with private sectors receiving funding from the government. Examples of government funded groups to pursue are:

  - Medicaid
  - Medicare
  - CHAMPUS
  - NHI
  - PSROs
  - HMOs
  - Manufacturers involved in government procurements

- Aerospace and other private industries that receive major funds from the government offer a ready market to the terminal supplier who is familar with their business and record keeping requirements.

Utilities

- The utility industry is a mature EDP user and by 1980 all large utility firms will have remote computing capability. Major types of applications for User Programmable terminals are scientific computation and general business. Primary applications are listed:

- Smaller motor freight companies have not fully automated many of their in-house administrative activities. Areas for penetration include:

  - Accounting
  - Billing
  - Statistical Reporting
  - Traffic Lane Analysis
  - Terminal Productivity
  - Maintenance Record Keeping

USER PROGRAMMABLE MARKETS - SMALL BASE - HIGH GROWTH

Insurance

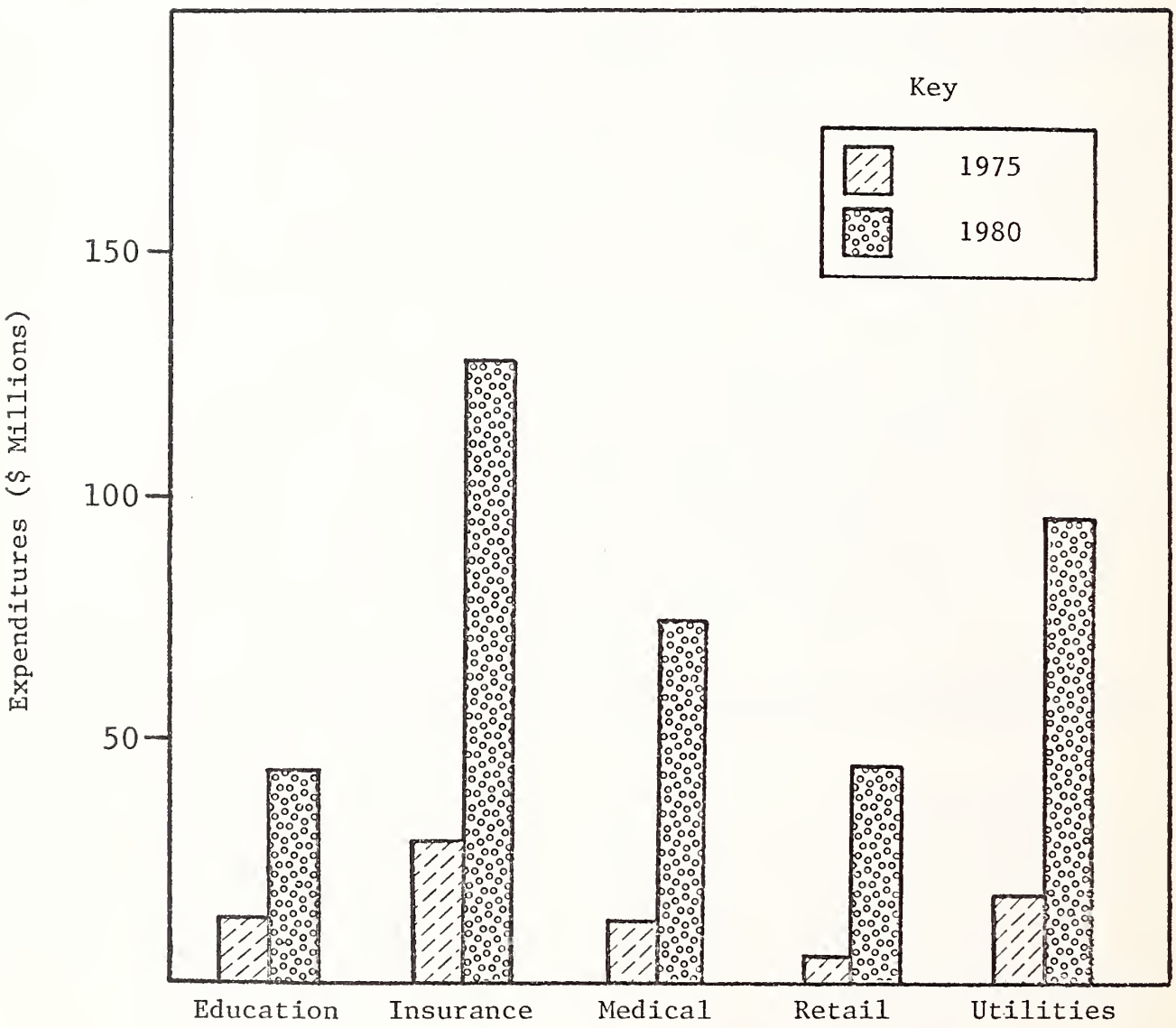
- The large and medium life insurance companies offer the greatest opportunity for User Programmable terminal suppliers. Major terminal applications will be:

  - Policy processing
  - Policy inquiry
  - Claims processing

- There is a continued emphasis on remote computing and the extension of services and entry responsibility to insurance agents in the field.

EXHIBIT III- 7

GENERAL PURPOSE/USER PROGRAMMABLE
TERMINAL EXPENDITURES



- Scientific Applications:

  Engineering Management: includes report generation, project planning, budget preparation, statistical analysis.

  Chemical and Petrochemical Engineering: includes simulation of process units and plants, running heat, mass and energy transfer calculations.

  Electrical/Electronic Engineering: includes dynamic systems simulation, linear analysis aids for control systems and simulation of digital systems.

- General Business Applications:

  Customer billing

  Accounts receivable/payable

  Financial analysis

  Capital investment analysis

Medical

- General purpose terminals with specialized applications for use in nursing work stations, pharmacology radiology, chemical laboratories, patient admissions and emergency are required.

- Selling terminals to hospitals requires specialized knowledge of this market. IBM is the key major computer supplier to approach the market; they are offering a stand-alone terminal to hospitals based on the System 32. NCR is also pursuing the market.

EXHIBIT III-8

GENERAL PURPOSE/USER NON-PROGRAMMABLE
TERMINAL EXPENDITURES

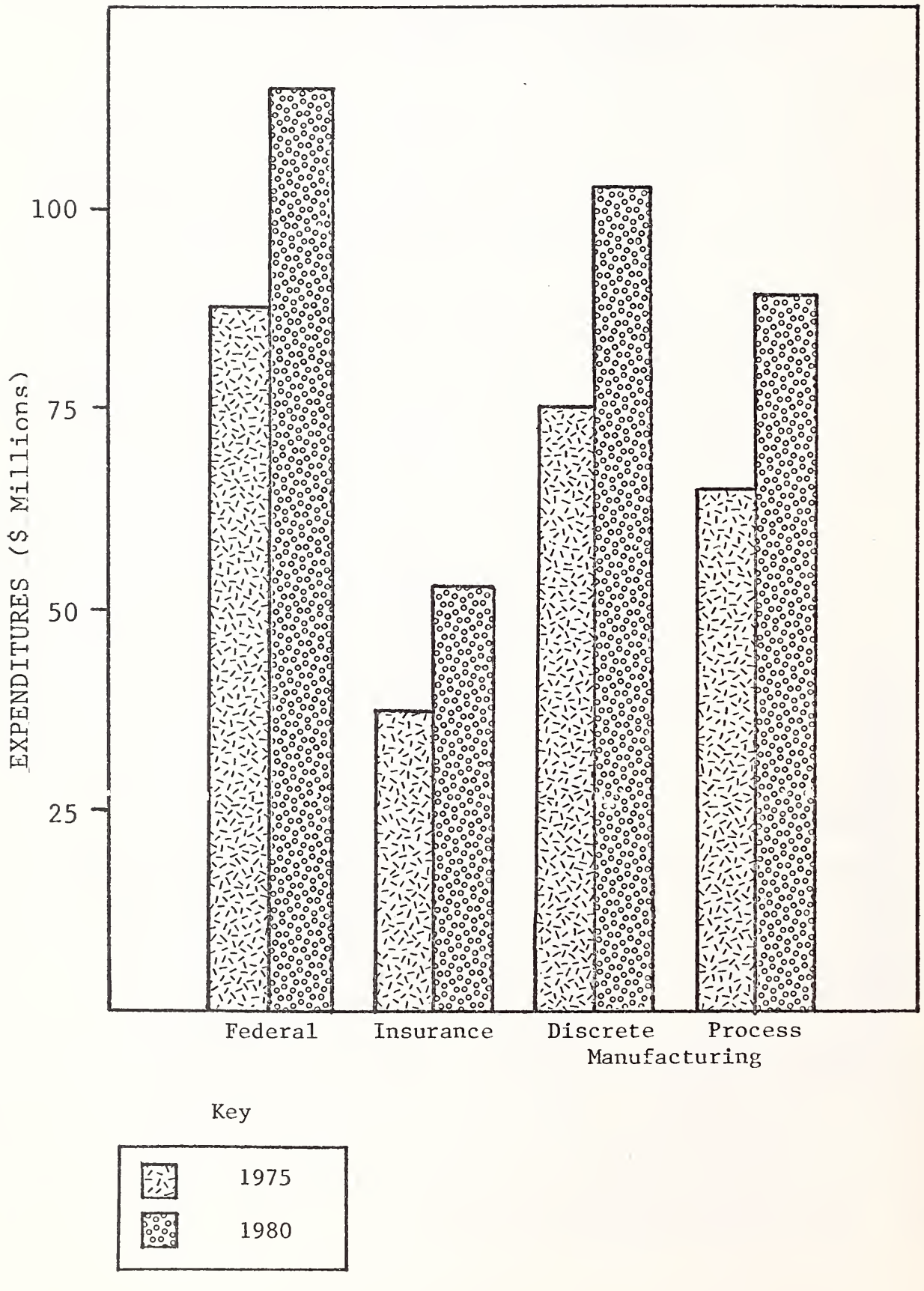
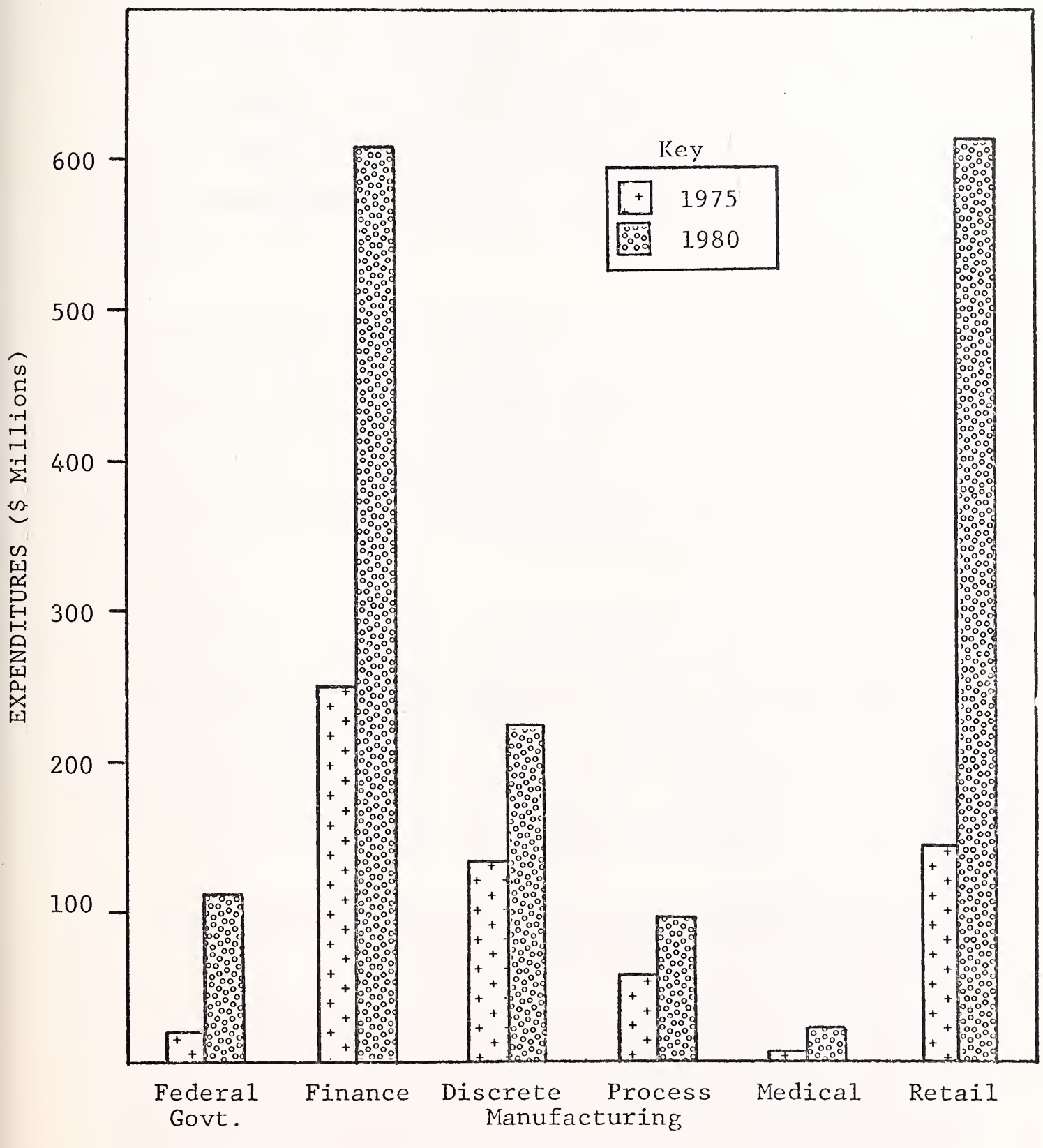


EXHIBIT III-9

LIMITED FUNCTION
TERMINAL EXPENDITURES



- This market offers most opportunity to the supplier who is aligned with a service company specializing in hospital systems like McAuto (Incoterm), Shared Medical Systems (Four-Phase) and Technicon.

- A potential new market exists for the User Programmable terminal supplier able to address a one-on-one sales market. Professional medical centers are ripe for a pre-packaged, simple approach to individual doctors' office record keeping and forms documentation (Medicaid, health insurance).

Retail

- The retail industry offers a rapid growing market for Limited Function terminals through 1980. Recent endorsement of the OCR-A code by NRMA for general and mass merchandise retailers opens the door for terminal manufacturers.

- Retailers who held off implementing POS because of lack of standards will now proceed. POS and upgradable electronic cash register systems will be the major Limited Function terminal markets. Systems currently being installed are primarily operating locally and in a remote batch mode for transmission of data at the end of the day.

- The retail industry offers a smaller but rapid growing market for User Programmable terminals through 1980.

- The need for order entry and inventory control subsystems by retailers and wholesalers will continue to grow. User Programmable terminals with micro and miniprocessing can satisfy this requirement.

Education

- Shortage of funds and declining enrollments will impact the need for terminals in the education sector. Universities and colleges are already major users of remote computing systems.

- User programmable terminals will be the fastest growing terminal market because they can be used for both computer training and research projects.

- User non-programmable terminals will have saturated this market by 1978 and will show a negative growth by 1980.

IV. END USER TRENDS

CENTRALIZATION/DECENTRALIZATION

- The question of centralization vs. decentralization is of major concern for the EDP manager trying to maintain compatibility of equipment and software in the remote computing environment. The major fear of the small user is the loss of operating control if User Programmable terminals are installed.

- Users planning remote computer applications are centralizing control of:
  - Central master files
  - Applications and systems programming

- Users planning remote computer applications are decentralizing control of:
  - Sub-system expenditures including terminals and peripheral devices.
  - Data entry by end-using group.
  - Transient files

PRIORITIES IN SELECTING PROGRAMMABLE TERMINALS

- Software capability and compatibility.
- Hardware price/performance.
- Vendor credentials.
- Reliability.

- The end user has a plethora of hardware manufacturers to choose from to complete its application needs. It is, however, generally locked into the operating system software of its existing mainframe vendor.

- Users are requesting easier programming systems compatible with in-house central computers. User Programmable terminals offer the flexibility to emulate mainframe software.

- Where the user has had good experience with multiple vendors, the emphasis is put on cost/performance. Many respondents to the interview indicated the price brought in by User Programmable vendors for a specific application was equal to or lower than the systems proposed by User Non-Programmable terminal or minicomputer vendors.

- Over 80 terminal manufacturers have been marketing their products since 1974. More companies are looking toward this market as "potential" products. The respondents to the interview however said that a vendor with 3-5 years of experience behind it was a requirement. This vendor is expected to provide application packages, programming staff, training centers and 2-4 hour service response. Exhibit IV-1 is a list of actual responses from end users when asked what their priorities were in choosing their terminal.

- The fourth priority in evaluating installed terminals is the service provided. End users expect near fail-proof devices. Vendors are generally on the spot because of large installations or mainframe interests. End users with few terminals say service is available within two through three hours.

EXHIBIT IV-1

USER PRIORITIES IN TERMINAL CHOICE

Priorities	Priorities
Vendor: Incoterm	Vendor: Burroughs
• Application Availability • Programming Flexibility • East of Programmability (high employee turnover) • Elaborate formating requirements • Need to drive multiple peripherals • Flexibility in data base retrieval • Ability to emulate • Technical survey resulted in large purchase though vendor was new • Take load off CPU • Priced better for function • Better communication link • Need for distributed processing • Editing • Ability to run terminals when CPU is "down"	• Application Specialty • Front end editing • Software • Recommended by outside agency • Appearance • Ability to switch • Document preparation • Only one unit available at the time • Vendor wrote application package as incentive • Hard copy feature offered • Disperse input to user sites to clean-up data • Compatibility with CPU software • Communication protocol compatibility • Price

EXHIBIT IV-1 (Continued)

USER PRIORITIES IN TERMINAL CHOICE

Priorities	Priorities
Vendor: Datapoint	Vendor: Sycor
• Vendor was only one available • Needed stand-alone for portability, backup • Dedicated lines too expensive • Best operating system • Editing capability • Move input function to user department • Maintenance • Ease of programming • Price/performance over minicomputers • Plug-compatible • Service centers	• Need to replace keypunch • Ease of programming • Desire to enter data at source department • Maintenance • Need formatting and editing ability • Compatibility with existing system • Vendor reputation • Other 'uses' • Eliminate duplicate verification • Bid did not request intelligence, Sycor won on price

PURCHASING THE REMOTE TERMINAL

- Responsibility for the purchase of terminal equipment continues to lie within the EDP department in most industries. But, the decision to implement a system which requires a remote terminal is becoming a joint venture between the EDP department and the using department. This is particularly the case in Education, Finance, large Manufacturing firms, Federal Government, Hospitals, and Transportation. As using departments become more aware of the applications and equipment available for handling their specialized needs and large file systems there will be an increase in requests to DP managers for their own processing capability. DP managers express the desire to keep authority to veto purchase of terminal equipment in order to maintain hardware and software compatibility, but are keen to let the operational aspects rest with the using department once compatibility has been established.

SERVICE/FLEXIBILITY/COST

- Respondents to the interview said terminals built in the last several years with primarily LSI technology do not require extensive servicing. Complaints on maintenance came from users with terminal devices installed in out-of-the-way locations. These users were understanding about the problem of maintaining these devices but expressed the need for better servicing.

- Users need terminal devices that have built-in reliability and serviceability. Where programmable terminals are implemented as part of the normal business operation, (banks, airlines, insurance, etc.), users tend to place cost second to ease of use in selecting devices. Ease of use includes: minimal operator training; I/O efficiency, low

error rates and fewer overall systems interference due to equipment malfunction. These factors are, of course, dependent on hardware reliability and serviceability.

USER PROGRAMMABLE AND LIMITED FUNCTION APPLICATIONS PARALLEL EDP INDUSTRY

- Installation of User Programmable and Limited Function terminals parallel that of the computer industry. Initial major demands are for accounting, order processing, inventory control and reservation applications. Banking and insurance companies led the way by determination of application needs.

- Accounting is the major User Programmable terminal application. Users expect their vendors to provide a variety of application packages in this area, for example:
  - Accounts Payable/Receivable
  - Billing
  - General Ledger
  - Payroll

- Order processing and inventory control applications are high potential sources of application interest at User Programmable terminal sites. Major users are discrete and process manufacturers.

- The large manufacturers' inventory control system is closely allied with the customer order processing function. The difficulty of developing and implementing such a system has discouraged the small manufacturer to attempt anything beyond batch inventory accounting systems which keep count of items.

- User Programmable terminal vendors may seek to complement the in-house or service bureau system by servicing the medium to large manufacturer with front end processing.

- Small manufacturers (annual revenues less than $10 million) frequently maintain inventory systems on Kardex files, or file cards. Posting, ordering and other record keeping are performed manually. Manual systems are expensive and often result in crowded warehouses or out-of-stock conditions due to oversight and errors. A small firm can show a substantial savings by doing some inventory control on a User Programmable terminal which would result in improved efficiencies and reductions in warehouse overcrowding and out-of-stock conditions. Small manufacturers welcome ready-to-use, application packages and have been receptive to the programmable terminal concept.

SPECIALIZED APPLICATIONS

- Exhibit IV-2 lists some of the general applications across industries and within specific industries. Needs vary by industry. In the medical industry for example, nursing service stations are anticipated to become the largest user of User Programmable terminals in hospitals. Multitasks at each station may include: Diet orders, room condition, transfers, availability of beds, drug allergy records, specialized patient care plans, and communication with pharmacology for patient drug needs. Pharmacology may be using a terminal itself for patient allergy records, drug profiles on patients, height and weight, and labelling of prescription bottles.

EXHIBIT IV- 2

TYPICAL INTELLIGENT TERMINAL APPLICATIONS

General Business Applications

- Accounting
  - Accounts Payable/Receivable
  - Banking
  - Billing
  - General Ledger
  - Payroll
- Brokerage Procedures
  - Depreciation/Amortization
  - Investment Analysis
  - Portfolio Analysis
  - Capital Investment Analysis
- Business Forecasting
  - Modeling/Simulation
  - Pricing
  - R & D
  - Scheduling
  - New Product Analysis
  - Distribution & Transportation Analysis
  - Inventory Control
  - Personnel Records
  - Sales Analysis
  - Order Processing

Industry Specialization

- Education
  - Instructional Programming
  - Registration
  - Text Editing
  - Student Records
  - Accounting
- Federal
  - Material Accounts
  - Building Inspection
  - Editing
  - Accounting
  - R&D, Lab Research
- Banking
  - General Ledger
  - On-line Mortgage & Savings
  - Loans
  - Personal Trust
  - Check Writing
  - On-Line Teller
- Insurance
  - Policy Inquiries
  - Agent Commissions
  - Policy Writing
  - Claims
  - Policy Updates
  - Premium and Loss
  - Endorsements
- Medical
  - General Ledger
  - Accounts Receivable
  - Patient Billing
  - Laboratory
  - Pharmacy
  - X-Ray
  - Nursing Service Stations
- Manufacturing
  - Production Control
  - Cost Accounting
  - Labor Distribution
  - Materials, Purchasing
  - Sales Order Processing
  - Service Center Inquiry
  - Warehouse Receiving
- Transportation
  - Scheduling RR Carriers
  - Waybilling
  - Passenger Service
  - Ticket Issue
- Utilities
  - R&D Engineering
  - Property Maintenance
  - Customer Service

- User Programmable terminal applications are regarded favorably by industries where a high turnover of personnel places the burden on the terminal to "program" its frequent, new users.

V. COMPETITION

• Shipments of User Programmable Terminals will increase from $640 million in 1975 to $1.8 billion in 1980, representing an average annual growth rate of 23.3% per year. Another growth area will be in shipments of Limited Function terminals. They will increase from $675 million in 1975 to $1.3 billion in 1980 representing an average annual growth rate of 13.3% per year.

MAINFRAME MANUFACTURERS ENTER TERMINAL MARKET

• Mainframe and minicomputer manufacturers were originally ambivalent toward the concepts of remote intelligence and front end processing because of the inherent loss in central processing. Wide user acceptance of these concepts and increasing user demand over the past two years for intelligent terminal products is causing some computer manufacturers to be in a hurry to catch up to partake of these growing markets.

• Some manufacturers are developing new User Programmable terminals (for example, IBM Models 373X) or aligning themselves with an independent terminal manufacturer as have Honeywell and NCR.

- Honeywell's Model MTS 7500 User Programmable terminal system is the Datapoint 1100 dual drive tape cassette terminal with an impact printer and disk drive. The system is available on a one or two year lease or at a purchase price of $9,800. Maintenance and software are supplied by Honeywell.
- NCR's 796 Series of Model 101,201 and 301 user non-programmable terminals are the Applied Digital Data Systems Models 580, 880 and 880A respectively. Over 2,000 terminals have been installed since first quarter 1975. The systems are available

on a one-year lease or at a purchase price ranging from $2,000 to $3,500. Maintenance and software are supplied by NCR.

- Burroughs is the largest producer of programmable teleprinter terminal devices. The wide range of devices available are generally upward compatible to protect the customers' investment in currently installed equipment and application programs. Application programs written in COBOL by Burroughs or the user for the older Burroughs terminals can be used without modification on comparably configured newer TC systems.

- All Burroughs programmable terminals use the Standard Data Communications Line Control (SDCL) procedures or the newer Burroughs Data Link Control (BDLC) which enables different types of terminals to share the same communications line and allows for economical expansion of networks to handle increased volumes and new applications.

- Current Burroughs programmable teleprinter terminals are:
  - The TC 750 was announced in 1975 as an update for the successful TC 700 teller terminal system. It is a programmable teleprinter designed for on-line, real time communication between a teller in a financial institution and a central computer or branch control computer. The dual magnetic tape cassette capability coupled with the TC 750's intelligence, allows the teller terminals to operate independently of the data communication network or the central processor. The purchase price for a typical TC 750 system with Automatic Passbook Reading (APR) feature and magnetic tape cassette is $13,640 and the system leases for $390 per month.

- TC 5100 Series is scheduled for delivery in 1976. It consists of four models, each in a desk type cabinet, with matrix printers and CRT display capabilities. The TC 5100 series is aimed at expanding Burroughs teleprinter markets to the financial community, medical and educational institutions, governmental agencies and businesses of all kinds. The Series employs a microprogrammed processor using LSI memory which is expandable from 4,096 bytes to 16,384 bytes. An important feature of the TC 5100 Series is the System Confidence Test Routines. These are stored programs which can be activated by the operator. They perform tests on the entire system including peripheral equipment, with results printed on a journal in English language statements. Purchase prices of typical systems range from $13,900 to $25,000 depending upon the amount of memory, peripherals and data communications procedures and interfaces. Typical monthly lease prices range from $430 to $780.

• IBM is responding to the fact that their market share for User Programmable terminals is low by expanding their product line.

- The remote batch, Model 2922 programmable terminal priced at $26,610 is a reworked IBM System 360 Model 20. Although it is cheaper and offers many of the same features as the Model 20, the Model 2922 is not price/performance competitive with the remote batch terminals offered by independent manufacturers.
- IBM announced the programmable teleprinter communication systems which is designated Model 77X for delivery in 1976. The Communications Terminals are functionally controllable by user-written programs and communicate with the host CPU using

BSC or SDLC. The purchase price for these terminals range from $13,200 to $21,000 (excluding maintenance) and each model is available under IBM's month-to-month plan and Extended Term Plan (a two year lease).

- IBM also announced recently their willingness to modify IBM software requirements by 1977 so that it will be easier for terminal users to operate non-IBM terminals in an IBM network environment. Users will be able to install SNA devices without having to add Virtual Terminal Access Method (VTAM).

- Despite this apparent "acceptance" of user demands for a more flexible terminal access method it is projected that IBM plans to increase its market share of User Programmable terminals to 30-40%. They will do this through expanded product line and marketing of total systems which includes extensive application packages.

- IBM is pursuing the Limited Function terminal market. Specifically, the Company is making headway with the Model 3650 point-of-sale system and the Model 3660 Supermarket system. IBM has installed the Model 3660 system in over 50 supermarkets in the U.S. which makes IBM the largest supplier to this Limited Function market.

INDEPENDENT MANUFACTURERS ESTABLISHED

- Independent terminal manufacturers have had the terminal market to themselves long enough to establish user recognition and user requirements for their products.

- Clear product image and product entrenchment are essential to the independent manufacturer for continued growth over the next five years.

This is particularly true because competition from mainframe and minicomputer terminal suppliers will increase as these companies expand their product lines and adopt microprocessor technology.

- Typically, the independent manufacturer designs his products for four replacement markets. These are the IBM 2780, the Control Data 200 User Terminal, the Univac DCT 200 and Univac 1004 -- all now obsolete.

- Datapoint is one of the largest independent suppliers of the CRT/keyboard type User Programmable terminals. The product line includes four models: Diskette 1100, Cassette 1100, 2200 and 5500. The two 1100 models can be used as programmable terminals or free-standing systems. The 2200 can be used as a free-standing system for single or multiple users and as a remote job entry terminal. The 5500 is marketed primarily as a free-standing multiple-user system. The two 1100's and the 2200 use essentially the same processor. The differences are in the peripheral complements which tailor the devices for different application functions. The 5500 has a faster, larger processor that is upward compatible with the 1100's and the 2200.

- Datapoint has developed processing languages, operating systems, terminal emulators and utilities to give the user the most flexibility possible in implementing a system. As a rule, Datapoint does not offer application software or programming support. There are several software houses that specialize in programming for the Datapoint processors. They offer application packages as well as custom programming services. Datapoint terminals can emulate any computer on the market through available software packages. Datapoint markets terminals to Honeywell Information Systems on an OEM basis and markets directly to the user. Main-

tenance is offered for prime-time service and at additional cost for full-time service. Rates range from $35 to $52 for prime time service.

- Datapoint sales at FY July 1975 end were $46 million up 28% over the previous year at $30 million. Datapoint has installed about 6,500 Datapoint 2200's and over 3,500 Datapoint 1100's. Purchase price, including a 4K memory module is $8,040 for the Cassette 1100 and $10,171 for the 2200. The Diskette with 16K memory is sold for $12,800. One, two and three year leases are also available.

- Incoterm's sales increased from $16.5 million in FY 1974 to $21.4 million in FY 1975 a growth rate of 30%. Previously oriented toward airline reservation and flight control applications, Incoterm has now expanded its marketing capability to include other industry sectors: transportation, motor freight and railroads; insurance; government; financial; and hospitals.

- Maintenance is available through Incoterm's 50 service locations in major metropolitan areas throughout the country. Users interviewed were satisfied with their service with the exception of those users who were in remote locations where 1-2 hour MTTR was not available.

- Incoterm has eight different terminal systems and a full line of terminal oriented peripherals. Approximately 15,000 terminals have been installed. Each terminal system consists of CRT/keyboard device(s) and a controller. The controller may be housed in the terminal or separately as a stand-alone depending on the device offered. Incoterm's major contributions to the programmable terminal market are described in the following paragraphs.

- The SPD 10/20 was Incoterm's first product. The first of over 8,000 SPD 10/20 terminals was delivered in 1970. It is offered in two configurations; the basic single station unit and a dual display which consists of a master terminal and an auxiliary terminal. The SPD 10/20 contains a stored program digital computer with 4,096 bytes of magnetic core memory. Available on a rental, lease, or purchase basis, the SPD 10/20 may be purchased as a single unit for $6,090 or a dual unit for $7,875. Monthly maintenance is $40 or $51, respectively.

- The SPD 10/25 is an update of the SPD 10/20. It was announced in 1974 and is "like" its predecessor with the exceptions that it has expanded software and expanded emulation capabilities and a separate 2,048 or 4,096 byte MOS memory for display screen refresh in addition to its core main memory. Available on a rental, lease or purchase basis, the SPD 10/25 may be purchased as a single unit for $7,045 or dual unit for $9,030. Monthly maintenance is $40 or $50 respectively.

- The SPD 20/20 is a multistation display system controlled by a separately housed TPU. The TPU may control eight 1920 character displays or sixteen 960 character displays in a cluster arrangement. The TPU contains a core memory for program execution and a refresh subsystem with up to 16K of refresh memory. The SPD 20/20 has a disk resident operating system implemented via diskette storage and is a totally programmable unit. The clustered system is available on a two year rental plan or for purchase with 4,8, or 16 display stations. Prices are $17,565; $25,875 and $41,155 with monthly maintenance ranging from $104 to $255.

- The SPD 320 is an IBM 3270 replacement CRT/keyboard multi-station system which is essentially a fixed configuration version of the SPD 20/20. It was announced in 1974 and is priced from $19,580 for eight 960 character display stations to $43,450 for sixteen 1920 character display stations.
- The SPD 325 was announced in 1974 as a stand-alone version of the SPD 320 and a direct replacement for the IBM 3275 Information Display System. Purchase price ranges from $5,565 for the single station 1920 character display terminal to $6,930 for a dual 960 character display terminal.

- Sycor is perhaps the largest independent supplier of programmable terminals. Revenues were $54.8 million in 1975, up 37% from $40.1 million in 1974. Shipments of programmable terminals exceed 30,000 units as of April, 1976. Sycor entered the market in 1969 with the first delivery of its Key-Cassette terminals. Sales by 1971 were over 1,200 and Sycor announced their now highly successful Sycor 340 terminal. In 1973, the Company introduced the Sycor 250, a user programmable replacement for the IBM 3270. Over 3,000 units have been shipped. Last year updates to the 340 were announced in single station and multistation arrangements.

- Sycor does more than 85% of the maintenance required by their customers; Sorbus, a nationwide service firm, handles the remainder. Like Datapoint and Incoterm, Sycor has an in-house service team of approximately 100 engineers. In addition, a 24 hour diagnostic center in Ann Arbor, Michigan for transmitting diagnostic programs to faulty terminals is available to users. Users like this unique capability of having in-house diagnostic programs as well as a vendor diagnostic center that is on-call.

- The Sycor 340 is a single unit CRT/keyboard terminal with an 8K byte ROM microprocessor and 1K byte RAM memory and one or optionally two magnetic tape cassette recorders. Over 22,000 Sycor 340's have been delivered. Originally developed in 1971, the 340 has been updated to include additional storage capacity with both flexible and hard disk storage capabilities. Purchase price for a single unit with one cassette recorder is $6,600 with an additional monthly maintenance charge of $25. One and two year leases are available at $175 and $148 respectively.
- Sycor's model 250 is a direct replacement for the IBM 3270. More than 3,000 units have been delivered over half of which were shipped to Olivetti, for marketing the system in European countries under the model number TCV 270. An 8K byte ROM and a 1K byte (expandable to 6K bytes) is provided for user programming. Diskette storage is also available. These features plus low cost, of $2,290 or rental of $105 and $25 monthly maintenance make the 250 a formidable competitor/replacement to the IBM 3270.
- Sycor updated the 340 and is now offering a model 350 programmable terminal that contains 16K bytes of programmable memory, microprocessor control, 576 character CRT display, a separate keyboard and a 500K byte dual diskette drive. The recording technique is compatible with the IBM 3740 except that data is written in ASCII code instead of EBCDIC. Sycor software supports ASCII-to-EBCDIC translation. The 350 leases under a one year ($306/month) or two year ($263/month) lease and may be purchased with 16K bytes, dual diskette and synchronous communications interface for $10,500.

- The Sycor 440 is transmission compatible with Sycor models 340 and 350 and with IBM terminals 2770, 2780 and 3780 via Sycor supplied program emulators. It is a clustered terminal processing system around a shared processor and consists of a microprocessor controller with 32K to 64K bytes of memory, 5.3 or 10.6 million bytes of fixed disk storage, magnetic tape cassette or diskette storage and up to eight CRT keyboard/display units. Production deliveries are planned for the first quarter of 1976. Purchase price for an eight station system including maintenance is $38,660. A four station system is also available at $29,090. One or three year lease arrangements may be made.

APPENDIX A

Study: User-Programmable Date of Call: _____ By: _____

SITE DATA (Complete as much as possible before call)

Name of Firm: _____ SIC: _____

City, State: _____ Phone: ( ) _____

Name of Contact: _____ Title: _____

Number of Employees: _____ Sales ($/year): _____

1. Has there been any change in your computer hardware within the past six months? ☐ Yes ☐ No

2. Do you plan to make any computer hardware changes within the next six months? ☐ Yes ☐ No

CURRENT COMPUTERS

3.

Mfr	Model

4.

Terminals	Qty	Model	Mfr
CRT			
Key + Printer			
Remote Batch			
Key Disc			
Card Reader			
Mark Reader			
Cassette/Tape			
Other			

5. How much has DP budget changed in 1976 over 1975 (± %) _____

6. Why has it changed? _____

7. What % of sales is DP budget (%)? _____

8. Center of Control for terminal orders: (e.g. user dept, DP Mgr)

9. Priorities in selecting an intelligent terminal:

10. Explain preference for intelligent terminals: (if any) tech. requirements

11. Product type:
    -Clustered
    -Stand alone

12. Terminals on order:

Mfr	Model	Qty

13. What applications use the terminal most:

14. Future applications

15. Features desirable on future terminals

16. Operating modes:
    -timesharing/programming
    -remote job entry
    -enquiry
    -source entry/collection

17. Trend toward centralization or decentralization

18. Reliability/service requirements

19. Selection of vendor

20. Impact current system has on selection of future terminals

21. Measurement of terminal productivity

INTELLIGENT TERMINAL APPLICATION

22. Application _____

23. When implemented? _____

24. What departments served?

25. Evolution of System:

26. What terminals required:

Mfr	Model	Qty	Line Speed	I=Installed P=Planned

27. What are system requirements for:

- File storage capacity
- File structure

28. What are system activities:

- Data entry
- Enquiry
- Transactions per terminal
- Time spent at terminal (hours per day)
- Computer processing (hours per day)

Study: User-Programmable Date of call: _____ By: _____

Name of Firm: _____ Vendor/ Third Party: _____

Address - Street: _____ City/State: _____ Zip: _____

Name of Contact: _____ Title: _____ Phone: ( ) _____

Number of Employees: _____ Sales ($/year:) _____

Has there been an addition to product line within the past year? ☐ Yes ☐ No

Do you plan to make any intelligent terminal changes within the next year? ☐ Yes ☐ No

CURRENT INTELLIGENT TERMINALS

3.

Mfr	Model	Price

How much have intelligent terminal sales changed in 1975 over 1974 (± %)? _____

Why has it changed? _____

What % of total sales is intelligent terminals (%)? _____

7. Technical features offered:

8. User attitude toward intelligent terminals:

9. Centralized vs decentralized system:

10. Future intelligent terminals in terms of equip features, software:

11. Future applications market:

12. Require extra training/promotional personnel:

13. Customer more sensitive to:

    - application requirement
    - price

14. Typical large order for what type application/industry:

15. Maintenance offered:

16. Product features required & preferred by users:

17. Communications/software/hardware interfaces required:

18. How large market 1975/1980:

19. Languages used:

20. System terminal replaces:

21. Send maintenance manual:

22. Cost of entry:

APPENDIX B

APPENDIX B

CHARACTERISTICS OF RESPONDENTS

- Exhibit B-1 shows the interview distribution by industry and those respondents with User Programmable terminals.

- The sample was geared to give the interviewer multiple contact with each industry user. It is not possible to derive any industry-related propensity to use User Programmable terminals from this list.

- For a variety of reasons the study covered more IBM central processor users than had been anticipated.
  - Interviews were primarily held with organizations with very large installations.
  - The penetration of IBM is very high in these organizations.
  - In order to cover the User Programmable terminal users and the people that were knowledgeable about them, known User Programmable terminal users were selected for interviews; many of these were at IBM installations

- Respondents were classified by the largest mainframe in the installation as follows:
  - Large - IBM System or equivalent 370/155 or larger
  - Medium - IBM System or equivalent 370/145 or less
  - Small - IBM System or equivalent minicomputer

A total of 36% of respondents were non-IBM users, 64% were medium and large IBM users.

- In Exhibit B-2, the analysis of respondents' vendor preference is shown. Respondents with multiple vendor terminals are typically

those with large central processing installations. However, there is no correlation between the choice of multiple vendor and the choice of central processor vendor.

- Of the small and medium respondents two IBM and one Burroughs user in different industries chose multiple terminal vendors. The remainder chose single vendor equipment.

- Only the medical field showed a response to third party affiliation. Hospitals are known for their reliance on outside computer associations.

- In Exhibit B-3 the majority of User Programmable terminals were found in the accounting departments of industry. These departments are perhaps the most educated as to new methods of doing business with the computer community and are choosing terminals more for what these devices can do for them in the future than for specific applications today.

- As opposed to the majority of industry respondents who use their terminals as simple CRT and keyboard devices, education, finance, insurance, medical and utilities companies responded with specialized needs for User Programmable terminals. Some applications indicated are:
  - Instructional programming
  - Brokerage procedures
  - On-line teller
  - Order processing
  - Nursing stations
  - Pharmacology
  - Circuit design
  - Engineering Problem Solving

- While Exhibit B-3 indicates strong areas of application preference, INPUT does not suggest these areas are primary targets in terms of quantity sales.

EXHIBIT B-1

RESPONDENTS BY INDUSTRY SECTOR

Industry Sector	# User Programmable Terminal Users	# User Non-Programmable Terminal Users	# Contacts without User-Programmable Terminals	# Total Contacts
Education	11	1	15	27
Federal	6	-	8	14
Finance	6	-	2	8
Insurance	6	-	9	15
Manufacturing:				
Discrete	9	-	15	24
Process	8	-	14	22
Medical	6	-	3	9
Retail	3	-	17	20
Transportation	5	-	14	19
Utilities	3	2	10	15
TOTAL	63	3	107	173
Other				
Vendor	9	-	1	10
Service Bureau	1	-	-	1
Service Houses	1	-	-	1
TOTAL	11	-	1	12

EXHIBIT B-2

RESPONDENTS' VENDOR SELECTION

Industry	Single Vendor	Multiple Vendor	Third Party	Other	Total Response
Education	6	2	-	3	11
Federal	4	1	-	1	6
Finance	3	3	-	-	6
Insurance	3	3	-	-	6
Manufacturing	9	7	-	1	17
Medical	4	-	1	1	6
Retail	3	-	-	-	3
Transportation	4	1	-	-	5
Utility	2	1	-	-	3
TOTALS	38	18	1	6	63

Total Respondents	11	6	6	6	9	8	6	3	5	3	63
Accounting	2	2	1		5	6	5	1	3	1	26
Brokerage Procedures			2								2
Editing	3	1									4
Engineering					3					4	7
Instructional Program.	4										4
Inventory Control					2	4		2			8
On-Line Teller			3								3
Order Entry				6							6
Medical Procedure							4				4
Production Control		2									2
Scheduling					1				3		4
Other	3	1	2		3	2		2	3		16
TOTAL APPLICATIONS	12	6	8	9	14	12	9	5	10	5	86
Industries	Education	Federal Govt.	Finance	Insurance	Discrete Mfg.	Process Mfg.	Medical/Hosp.	Retail	Transportation	Utilities	Total Number

EXHIBIT B-3

RESPONDENTS' APPLICATIONS BY INDUSTRY

EXHIBIT B-4

END USER INTERVIEW POPULATION

INDUSTRY SECTORS	NUMBER OF INTERVIEWS
• Education	11
• Federal Government	6
• Finance	6
• Insurance	6
• Discrete Manufacturing	9
• Process Manufacturing	8
• Medical-Hospital	6
• Retail	3
• Transportation (Air, Motor Freight, Rail)	5
• Utilities	3
	63

SYSTEM REPRESENTATION

- Burroughs 3500-7600
- CDC 3400-7600
- HIS 200-2000
- HIS 6000-6610
- IBM 360/20-195
- IBM 370/115-168
- IBM S3/10
- Univac 1106-1108
- Univac 9300
- Univac 5-70
- Data General Nova 1200
- DEC PDP Series
- HP 2000F
- RCA System 6